ISI-501 Series
Stand-alone Photovoltaic (PV) Inverter User Manual

Stand-alone Photovoltaic (PV) Inverter User Manual

Table of Contents

1.Safety Guidelines 1
2.Introduction 1
2.1 Features 1
2.2 Main Specification 2
3.User Interface Panel 2
3.1 Front Panel 2
3.2 LED indicator on Front Panel 3
3.3 Rear Panel 3
4.Output Voltage and Frequency Settings 4
4.1 Initial Factory State 4
4.2 Procedure to Setting Output Voltage and Frequency 4
5.Operating 6
6.Protection 7
6.1 Input Protection 7
6.2 Output Protection 7
7.Installation & Wiring 7
8.Troubleshooting 10
9.Warranty 10

Nov. 2013 Version 0

1.Safety Guidelines (Please read through this manual before assembling the Inverter)

- Risk of electrical shock and energy hazard. All failures should be examined by a qualified technician. Please do not remove the case of the inverter by yourself!
- Please do not install the inverter in places with high moisture or near water.
- Please do not install the inverter in places with high ambient temperature, under direct sunlight, or near fire source.
- Please only connect batteries with the same brand and model number in one battery bank. Using batteries from different manufacturers or different capacities is strictly prohibited!
- Never allow a spark or flame in the vicinity of the batteries.
- Make sure the airflow from the fan is not obstructed at both sides (front and back) of the inverter. (Please allow at least 15cm of space)
- Please do not stack any objects on the inverter as it may impede heat dissipation.
- Please turn off the inverter through the power ON/OFF switch, before removing the battery.

⚠ **WARNING: Batteries will have aging problems after years of operation. It is suggested to execute regular battery maintenance (e.g. every year). Once aged, the batteries should be changed by a professional technician, or the failed batteries may cause fire or other hazards.**

Don't disassemble | Keep away from moisture | Keep away from fire or high temperature | Don't stack on the inverter | Keep good ventilation

2.Introduction

- ISI-501 is a true sine wave DC/AC inverter equipped with a solar charger (with MPPT) which is digitally controlled by an advanced microprocessor and is designed for high frequency operation. This high performance inverter can be paired with both battery and PV modules / panels.
- ISI-501 can provide 500W pure sine wave output continuously, 550W for 1 minute, and sustain a peak load of 1000W as long as 30 AC power cycles.
- ISI-501 adopts a high frequency design which greatly reduces product weight and improves maximum efficiency to 88%.
- ISI-501 has a built-in solar charger with the MPPT function which effectively utilizes energy from the PV module.
- ISI-501 progresses the concept of a miniature independent power station. It is ideal for areas suitable for PV modules and where mains power is absent.

2.1 Features

- 500W rated output
- Surge power capability up to 1000W
- True sine wave (THD<3%)

- AC output voltage tolerance : ±3%
- High efficiency up to 88%
- Built in MPPT solar charger, MPPT efficiency: 98%(Typ.)
- Adjustable output voltage and frequency
- LED indication for operation and battery capacity
- Battery low alarm (with electrically isolated dry contact)
- Remote On/Off function
- Compliance to FCC / CE regulations
- 3 year warranty

2.2 Main Specification

	MODEL	112	124	148	212	224	248
OUTPUT	Power Rating	500W continuous; 550W for 1 min.; 1000W for 30 AC power cycles (450W; 495W; 900W for 112, 212 models)					
	Factory Setting	110Vac, 60Hz (Default)			230Vac, 50Hz (Default)		
	Output Voltage	100 / 110 / 115 / 120Vac (Adjustable)			200 / 220 / 230 / 240Vac (Adjustable)		
	Protection	AC short, overload, and over temperature					
INPUT	Bat. Voltage	10.5 ~ 15.0V	21.0 ~ 30.0V	42.0 ~ 60.0V	10.5 ~ 15.0V	21.0 ~ 30.0V	42.0 ~ 60.0V
	DC Current	50A	30A	15A	50A	30A	15A
	Efficiency	85%	87%	87%	86%	88%	88%
	Off Mode Current Draw	Under 1.0mA while power switch OFF					
	PROTECTION	Over current, battery reverse polarity (internal fuse), battery low alarm, battery low shutdown					
PV Module	Open Circuit Voltage	35~50V	45~90V	90~160V	35~50V	35~90V	70~160V
	MPPT Voltage Range	25~50V	35~90V	70~160V	25~50V	35~90V	70~160V
	Maximum Short Circuit Current	11A	7A	4.5A	11A	7A	4.5A
AC Charger							
Charge Voltage		14.4V	28.8V	57.6V	14.4V	28.8V	57.6V
Charge Current		30A	17A	8.5A	30A	17V	8.5A

3.Main Specification

3.1 Front Panel

Ⓐ **AC Output Outlet:** To satisfy global demands, there are many optional AC outlets to choose from.

Receptacle type							
	TYPE-A	TYPE-B	TYPE-C	TYPE-D	TYPE-E	TYPE-F	TYPE-U
	Standard	Standard	Optional	Optional	Optional	Optional	Optional
Country	USA	EUROPE	AUSTRALIA	U.K	JAPAN	GFCI	UNIVERSAL
Certificate	FC	CE	CE	CE	FC	FC	Non

Ⓑ **LED Indicator (Status):** Displays the operation status of the ISI-501.
Ⓒ **LED Indicator (Battery):** Displays remaining capacity of battery.
Ⓓ **Function Setting:** Output voltage and frequency can be set through this button.
Ⓔ **Power ON/OFF Switch:** The inverter will turn OFF if the switch is in the OFF position.
Ⓕ **Ventilation Slits:** The inverter requires good ventilation for proper operation and for prolonging its lifetime.

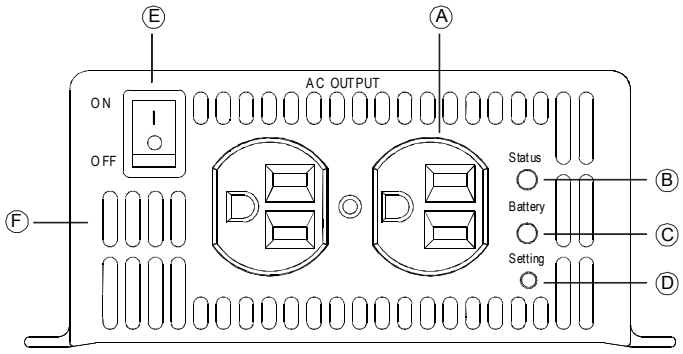


Figure 3.1 Front Panel(Type A)

3.2 LED Indicator On Front Panel

Operation Status Indicator (Status LED) : Represents the current ISI-501 state.

LED Display	Green	Orange	Red
Status	Normal Operation	Remote Off	Error

*Note : When an error occurs, please refer to chapter 8 "Troubleshooting" of the user manual.

Battery Capacity Indicator (Battery LED) : Represents the remaining capacity of external batteries.

LED Display	Green	Orange	Red
Battery Capacity	>70%	40 ~ 70%	<40%

3.3 Rear Pane

Ⓐ **Battery Input(+),(-):** Pay extra caution to battery polarity when wiring.
Ⓑ **Fan Ventilation Opening:** The inverter requires good ventilation for proper operation and for prolonging its lifetime.
Ⓒ **Remote ON/OFF Control:** While set at ON, the ISI-501 can be powered ON/OFF through remote control.

Connector Status	Inverter Status
Open	Remote ON
Short	Remote OFF

Ⓓ **Battery Low Alarm:** This is an electrically isolated dry contact which can provide the user with an external control signal. User will be alarmed of a low battery when the two pins are open while the ISI-501 makes a "Beep" sound.

Battery Status	Connector Status	Alarm
Battery Low	Connector Open	"Beep" Sound
Battery Normal	Connector Short	-----

Ⓔ **PV Input Terminal(+),(-):** Pay extra caution to PV module polarity when wiring.

Ⓕ **Grounding Terminal(FG).**

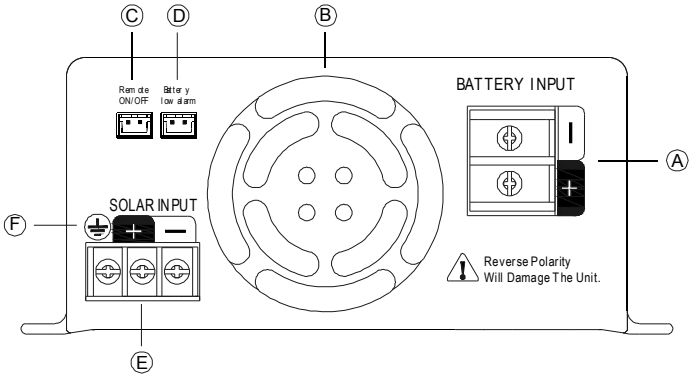


Figure 3.2 Rear Panel

4.Output Voltage and Frequency Settings

4.1 Initial Factory State

Initially the ISI-501 is set to output 110Vac at 60Hz or 230Vac at 50Hz.

4.2 Procedure to Setting Output Voltage and Frequency

The user can adjust the output voltage and frequency through the function setting button on the front panel. After changing the settings, the inverter will reboot and set the user input values as default. In the future, even if the battery is removed, or is there is no source of power, the inverter will keep these most recent values that the user input.

Step 1: The inverter should be turned off while resetting. Input batteries should be connected and the loads should be removed.

Step 2: Use an insulated stick to press down on the setting button and then turn on the power switch; the Panel's orange colored LED should flash. After pressing for 5 seconds, the inverter will send out a "Beep" sound. User can release the button and go on with the setting procedure.

Step 3: Check output voltage and frequency with table 4-1. If the output is desired, please continue to step 5; if not, please continue adjusting according to step 4 until it is.

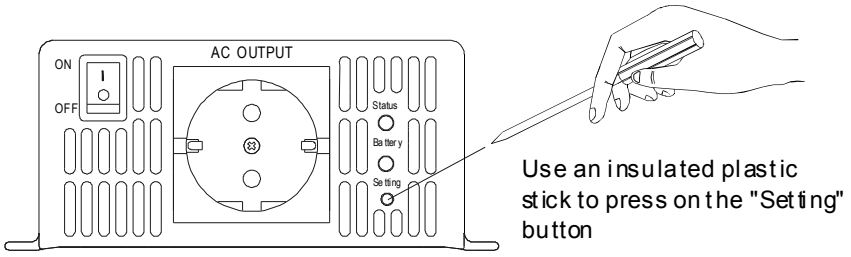


Figure 4.1 Adjusting output voltage and frequency

Table 4-1 Voltage & Frequency Chart

O/P Voltage / Frequency		100Vac (200Vac)	110Vac (220Vac)	115Vac (230Vac)	120Vac (240Vac)
50Hz	Status	● Red	● Red	● Red	● Red
	Battery	● Green	★ Green	● Yellow	★ Yellow
60Hz	Status	★ Red	★ Red	★ Red	★ Red
	Battery	● Green	★ Green	● Yellow	★ Yellow

● Light ★ Flashing

Step 4: Press the setting button around 1 second before letting go. The LED indicators (Table 4-1) will change status. Please adjust accordingly.

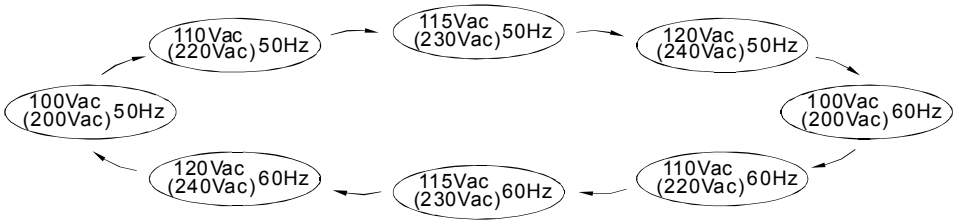


Figure 4.2 Output voltage & frequency changing sequence

Step 5: When the output is at user's desired value, press and hold the setting button for 3~5 seconds until the inverter makes a "Beep" sound. The output setting is now complete; the inverter will now save the settings and restart.

5.Operation

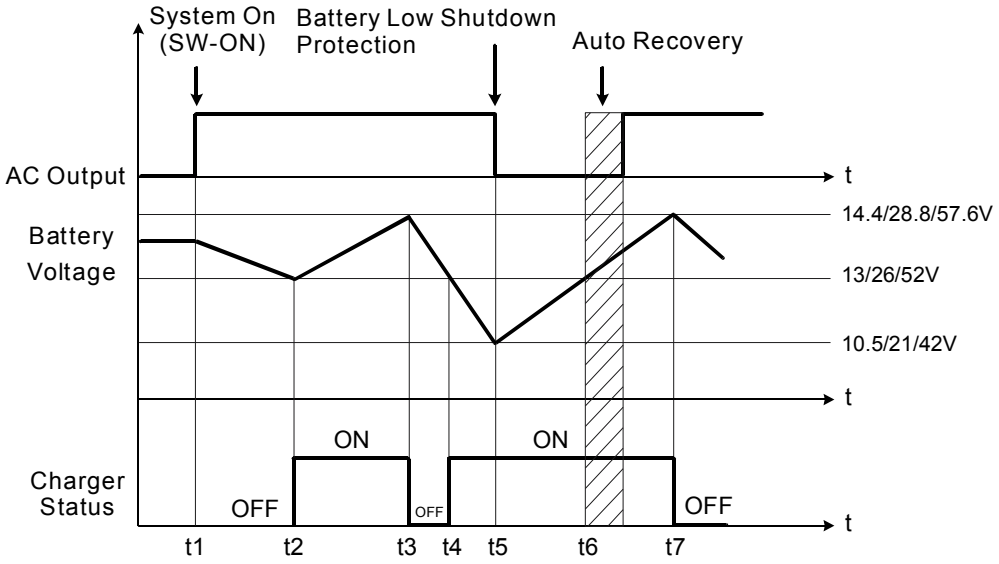


Figure 5.1 Operation Sequence

t1: When user turns on the ISI-501, battery voltage will be sensed. If battery voltage is greater than 13/26/52V, it is adequately charged and the charger circuit will not activate to prevent overcharging.

t2: While the ISI-501 operates, battery voltage will slowly drop; when battery voltage is lower than 13/26/52V, battery low signal is sensed and the charger will automatically activate and charge accordingly.

t3: If the power provided by the PV module is greater than load consumption, the battery will increase in voltage. When this battery voltage reaches 14.4/28.8/57.6, the charger circuit will shut off its charging current to the battery modules, to prevent the batteries from overcharging.

t4: When battery voltage drops to 13 / 26 / 52V again，the charger will automatically restart charging action.

t5: If the power provided by the PV module is less than load consumption, even if the charger is operational, the battery voltage will still drop. When battery voltage is below 10.5/21/42V, the ISI-501 will shut down output voltage to prevent the battery from over discharging thereby increasing its lifetime.

t6: Under circumstances that the charger continuously charges the battery, the battery voltage will slowly increase. When battery voltage reaches 13/26/52V, the system will restart after three minutes and start providing AC voltage output.

t7: Same action as t3.
The status of the inverter changes depending on the power provided by the PV module and its load consumption.

6.Protection

6.1 Input Protection

(A)PV Module Reverse Polarity Protection: In the case where the user accidently reverses the polarity of the PV module, the ISI-501 internal fuse will blow to protect other circuitry. Please contact your nearest distributer or send the goods back to Mean Well for repair.

(B)Battery Reverse Polarity Protection: In the case where the user accidently reverses the polarity of the battery connection, the ISI-501 internal fuse will blow to protect other circuitry. Please contact your nearest distributer or send the goods back to Mean Well for repair.

(C)Battery Low Shutdown Protection: When the battery voltage is lower than rated shutdown point, the ISI-501 will shut down to guarantee the lifetime of the battery.

(D)Battery Overvoltage Protection: When the battery voltage is too high, the inverter will shut down and an alarm will sound. Please resolve the error and restart the inverter to return to normal operation.

⚠ WARNING:

Before installation or after use, make sure the power ON/OFF switch at the front panel is in the OFF position to safely wire or remove battery.
Under normal working conditions, please choose suitable batteries that are within the input DC voltage range of the inverter (refer to spec).
If the input DC voltage is too low (e.g. using 12Vdc battery bank for 24Vdc models), the inverter cannot startup properly.
If the input DC voltage is too high (e.g. using 48Vdc battery bank for 24Vdc models), the inverter will get damaged.

6.2 Output Protection

If the ISI-501 detects any of the following errors while operating, the status LED indicators will stay lit until the error is removed.

(A)Over Temperature Protection(OTP) : When the internal temperature of the ISI-501 reaches a threshold, over temperature protection will activate causing shut down. Wait at least 30 minutes before restarting to recover normal operation.

(B) AC Output Short Circuit Protection: When the AC output of the ISI-501 is short circuited, it will go into protection. Restart to recover normal operation.

(C) Over Load Protection: When the load is in the over load range of 500~550W (450~495W for 112/212 models), the inverter can continue supplying power for a short duration of 1 minute. If the load is not removed, the sensing circuit will activate causing shut down.

7. Installation & Wiring

(A)Wiring for batteries: Wire connection should be made as short as possible less than 1.5m is highly recommended. Also make sure suitable wires are chosen based on safety requirement and current rating. Cross sections that are too small will result in lower efficiency, less output power, and the wires may also become

overheated and cause danger. Please refer to table 7.1 or consult us or our distributors if you have any questions.

Table 7-1 Suggestion for wire selection

Cross section of wire lead(mm^2)	AWG	Suggested Model
1.5	14	PV module input wire
2.5	12	48V battery models
4	10	24V battery models
6	8	12V battery models

(B)Suggested Battery Type and Capacity

Battery Type	Lead-acid		
Battery Capacity	12V models	24V models	48V models
	12V / 120Ah ~ 12V / 400Ah	24V / 60Ah ~ 24V / 200Ah	48V / 30Ah ~ 48V / 100Ah

Note : If the desired battery type is not Lead-Acid based, please contact the battery manufacturer for an advised value.

(C)Installation Requirements:

- The unit should be mounted on a flat surface or holding rack with suitable strength. In order to ensure the lifespan of the unit, please refrain from operating the unit in dusty or moist environments. This is a power unit with built-in DC fan. Please make sure the ventilation openings are not blocked and refrain from continuous operation with heavy load in high ambient environment because this may prevent inverter from operating properly and its life span may be affected. We highly recommend that there should be no objects impeding airflow within 15cm of the ventilation openings.

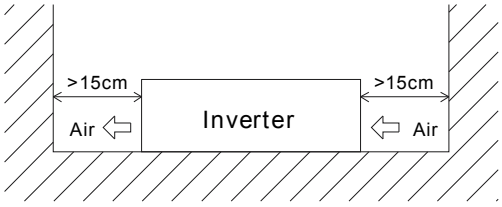
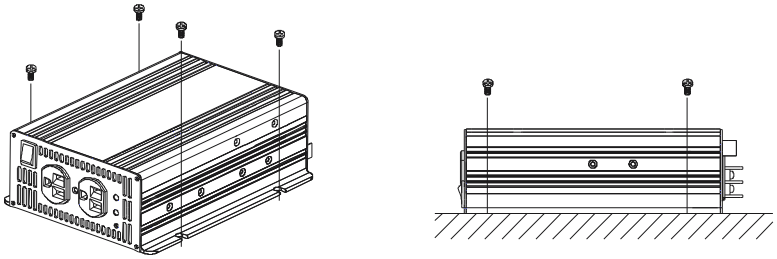


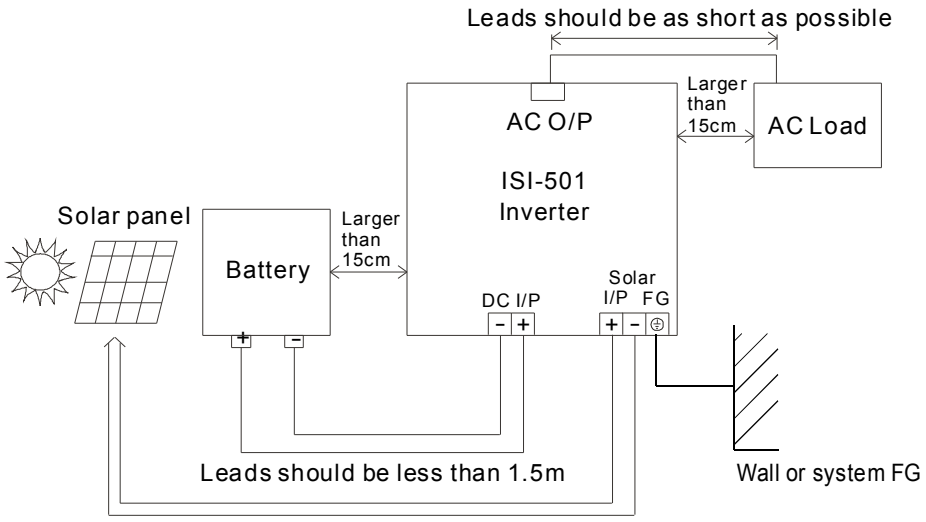
Figure 7.1: Example of Installation

(D)Suggested Mounting

The case has four reserved holes for fixing, the user can utilize these to mount the ISI-501 as shown below. It is advised to mount the ISI-501 horizontal.



(E)Example of System Setup



(F)Derating

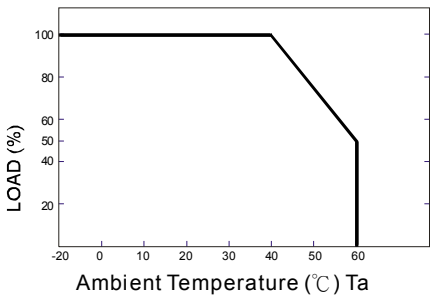


Figure 7.2 Output Derating Curve

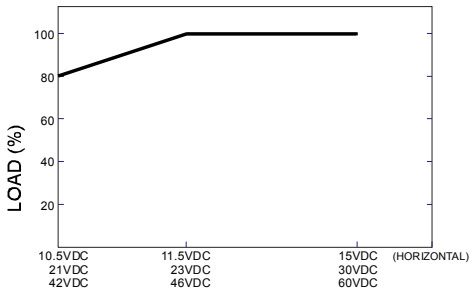


Figure 7.3 Input Derating Curve

(G) ⚠ Notes on Output Loads:

ISI-501 Series can power most equipment requiring an AC source of 500W, but for certain type of load, the unit may not work properly.

(1) Since inductive loads or motor based equipments needs a large start up current (6~10 times of its rated current), please make sure this startup current is less than the maximum current capability of the inverter.

(2) When the loads are capacitive or rectified equipments (such as switching power supply), we suggest operating these equipment at no load or light load during power ON. Increase the load slowly only after the ISI-501 has started up to ensure proper operation.

8. Troubleshooting

ISI-501 is a complex product which should be serviced by professional technician. Improper usage or modification may damage the unit or result in shock hazard. If you are not able to clear the failure condition according to the following instructions, please contact us or your closest distributor for repair service.

Failure Statue	Possible Reasons	Recommended Solutions
No AC Output Voltage	Abnormal Input	Check the DC input sources (PV/ battery) to make sure the voltage is within the required range
	Over Temperature Protection	Make sure that the ventilation is not blocked and the ambient temperature is not too high. Please derate load usage or lower the ambient temperature
	Overload Protection	Make sure the output load does not exceed the rated value or the peak startup current is not too high, typically found in inductive or capacitive loads
	Short Circuit Protection	Make sure the output is not overloaded or short circuited
Battery Discharging Period to short	Battery Aged or Broken	Replace the batteries
	Battery Capacity is too Small	Reconfirm battery specification and enlarge the battery capacity as suggested

9. Warranty

Three years of warranty is provided under normal operating conditions. Please do not change components or modify the unit by yourself or attempt to repair the unit by yourself because Mean Well reserves the right to void the warranty.

明緯企業股份有限公司
MEAN WELL ENTERPRISES CO., LTD.
248新北市五股工業區五權三路28號
No.28, Wu-Chuan 3rd Road, Wu Ku Ind. Park, Xinbei City, Taiwan, 248
Tel:886-2-2299-6100 Fax:886-2-2299-6200
http://www.meanwell.com E-mail:info@meanwell.com

Your Reliable Power Partner